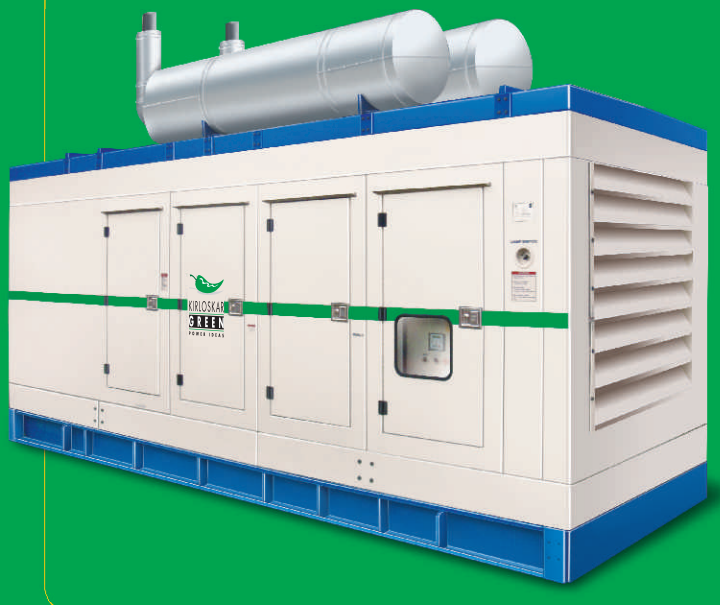
Enriching Lives

GENSET

OWNER'S MANUAL



Help Desk

Call 1800 233 3344
020-6608 4608
Email : koel.helpdesk@kirloskar.com
Customer assistance is also available
from our help desk 24 hrs.x 7 days a week)
for all after sales assistance.

Power, Performance, Peace of Mind

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KIRLOSKAR GREEN POWER IDEAS

GENSET

OWNER'S MANUAL

Enriching Lives

KIRLOSKAR OIL ENGINES LIMITED

KIRLOSKAR OIL ENGINES LIMITED | First Edition- April 2012| Issued by Customer Support

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In view of continuous product updating and design changes, contents of this Manual are subject to change without prior notice.

Kirloskar Engines: Prime Movers to the Indian Nation.

1946 saw Kirloskar Oil Engines Limited (KOEL) taking shape. A powerhouse today, it easily stands out as India's leading manufacturer of engines, giving its customers a wide choice ranging from 3 hp to 800 hp, and 2400 hp to 11000 hp. Manufactured in both air-cooled and liquid-cooled versions, every detail in these engines is carefully perfected.

A variety so large also makes these engines the backbone in many industries, including the role of prime movers for industrial, agricultural, construction, power generation and marine applications. On the other hand, engines ranging from 2400 hp to 11000 hp are also used for marine propulsion and auxiliary power on naval and coast guard ships. Such a wide acceptance has resulted in increase in demand for engines in all market segments.

Being a leader is also about being driven by technology. And that means constant technology up-gradation, in-house research, investment in state-of-the-art manufacturing facilities with thoroughly perfected processes. All aimed at one goal: Deliver well thought-out quality products and services to the customers at competitive prices. Of special mention are critical components like crankcases, crankshafts, camshafts and connecting rods that are manufactured in-house. KOEL also manufactures for its exclusive use, special purpose machines to achieve critical degrees of precision that international specifications demand. This practice towards achieving efficiency and performance is a mantra at all KOEL plants, starting from the main engine manufacturing plant at Pune to all the other units at Nashik, Ahmednagar, Rajkot, Indore and Kolhapur.

This rigorous internal quality pace easily makes sure that KOEL's processes meet all the standards that global specifications demand. In 2007, ABS QE (USA) awarded KOEL Khadki plant the prestigious ISO-TS-16949-2002 and ISO 14001 certification for its Quality Management Systems. Similarly, the belief that industry and environment can co-exist, led to in-house development of the environmental-friendly engines produced using environmental-friendly manufacturing facilities. Recognition for this came as an ISO 14001 certification for Environment Management Systems in 1999.

Customer Support:

Assurance through adequate product support is derived out of clear thought processes, coupled with the most extensive service network in the country. Around 90% of Kirloskar engines are within 80 km of a Kirloskar Service Dealer. 342 Service Dealership outlets are operating efficiently to provide relentless service to customers. The dealership locations and infrastructure is continuously assessed based on the Kirloskar engine population build-up in each territory and the customer's emerging service needs. Out of these, 210 Service Dealership locations provide 24-hour service as of December 2011, with the number growing steadily. Add on, Kirloskar Service Managers, Service Engineers and Technicians have been stationed at 14 Kirloskar Area and Regional Offices. A well spread out service network manned by about 3500+ Kirloskar trained engineers and technicians ensure prompt service and easy availability of genuine consumable and spare parts, making sure that there's always the highest up-time for Kirloskar engines.

All-pervasive IT in Operations:

Having forethought and foreseen the power of Information Technology (IT) to transform businesses, Kirloskar installed Oracle's Enterprise solutions in 1998. The company has also launched Oracle CRM (Oracle Customer Relationship Management) module in 2006 to serve customers pro-actively.

This exercise by itself is noted to be one of the most extensive installations of Oracle© in the manufacturing industry.

The installation of ERP was followed by net enabled business processes in 2000. This networked Kirloskar Service Dealers, AGOEMs, Area Sales Offices, Suppliers and the Logistic Providers into a closely-knit digital community. Such a high, internet-led IT-focus has helped Kirloskar service its customers with a new-found efficiency, 365 days a year, 24 hours a day. So whether it's the latest service information or parts availability, expect complete information access at the touch of a button.

DG Genset the Specific Anecdote:

We are recognized as one of the world's leading generating set manufacturers. " Kirloskar Green Genset " is a major player globally, specialized in manufacturing of both air cooled & water cooled Engines / Diesel Gensets with power output covering from 5 kVA to 625kVA & 1800kVA to 6300 kVA.

We have been instrumental in developing the latest technology driven products to suffice power requirements of every individual customer from different market segments.

We provide reliable & high quality products at competitive cost.

We also provide variety of alternative fuel gensets, which efficiently run on Bio Diesel, Bio Gas, SVO (Straight Vegetable Oil) and Natural Gas as per customer requirement.

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Welcome to the family of Kirloskar Oil Engines Ltd. You are a proud owner of The Best & Preferred Nation's own Kirloskar Green Power Ideas – Genset (KGPI Genset).

This product is designed to deliver full rated output with high degree of reliability. Utmost care is taken while manufacturing the generating set to ensure to deliver the best performance to the end user. To get the best performance from the generating set, the installation and continuous maintenance of the set are the important factors.

This booklet describes simple procedures that should be followed to get the best output from the generating set. If the installation and maintenance procedures are followed, the generating set will deliver the output for prolonged time and will also ensure

- ⇨ Better reliability
- ⇨ Highest uptime
- ⇨ Improved aesthetic
- ⇨ Better working conditions

Our Area offices and 'Service Dealer' network will be pleased to provide you the necessary support and guidance. The details of this network are provided at the end of this booklet.

Before operating the KGPI Genset, read the User Manual to become familiar with your generating set. Safe and optimum operation can only be possible if the generating set is properly operated and maintained. Once again thank you for showing your trust by selecting KGPI Genset.

About this manual

This manual provides installations and commissioning general guidelines and recommendations for KGPI Genset. In this manual different types of installations (Free field, Roof-top, Basement, and Structural, etc.) have been considered while preparing the guidelines and recommendations. However, in case of a customized or critical installation need, kindly consult Seller or Kirloskar Area Office.

The information is supported by different photographs, diagrams and tables. Adequate information is compiled together, keeping in mind to make this manual crisp, handy and user friendly.

We are sure; this manual will be useful for installation to the end user to achieve desired performance of the KGPI Genset.

Overall Specifications of Kirloskar Green Silent Gensets

Liquid (Radiator) cooled Silent Gensets

Genset Model	Engine Model	Engine Power at 1500 rpm.kW (hp)	Prime Power Genset rating at 0.8 pf (kVA)	Overall Canopy Dimensions L x W x H (mm)	Approx. weight (with canopy) kg.
KG7.5WS	EW14	10.3 (14)	7.5	1725 x 845 x 1155	745
KG10WS	EW14	10.3 (14)	10	1725 x 845 x 1155	755
KG15WS4	2R1040	20.6 (28)	15	2050 x 950 x 1220	915
KG20WS4	2R1040	20.6 (28)	20	2050 x 950 x 1220	925
KG25WS5	3R1040	30.9 (42)	25	2380 x 950 x 1230	1020
KG30WS	3R1040	30.9 (42)	30	2380 x 950 x 1230	1050
KG40WS	4R1040	41.2 (56.1)	40	2650 x 1050 x 1605	1520
KG50WS	4R1190	45.6 (62)	50	3350 x 1190 x 1650	1500
KG62.5WS2	4R1040T	61 (83)	62.5	3240 x 1140 x 1585	1900
KG82.5WS2	4R1040TA	77.2 (105)	82.5	3240 x 1140 x 1585	1950
KG100WS	4K1080TA	92 (125)	100	3200 x 1300 x 1805	1950
KG100WS2	6R1080T	93.3 (127)	100	3450 x 1300 x 1900	2500
KG125WS2	6R1080TA	113.2 (154)	125	3450 x 1300 x 1900	2700
KG140WS2	6K1080TA SrI	127.5 (173.5)	140	4040 x 1540 x 1900	3500
KG160WS2	6K1080TA	164.5 (200)	160	4040 x 1540 x 1900	3550
KG180WS	6SL1500TA SrI	165 (224)	180	4940 x 1700 x 2050	3870
KG200WS	6SL1500TA SrII	184 (250)	200	4940 x 1700 x 2050	3950
KG250WS1	6SL8800TA	228 (310)	250	4940 x 1700 x 2050	4660
KG320WS3	DV8 SrI	294 (400)	320	5700 x 2000 x 2555	5650
KG380WS	DV8 SrII	346 (471)	380	5700 x 2000 x 2555	5850
KG400WS2	DV8	360 (490)	400	5700 x 2000 x 2555	6000
KG500WS3	DV10	448 (608)	500	6200 x 2000 x 2555	6655
KG600WS2	DV12	532 (723)	600	6660 x 2000 x 2705	7500
KG 625WS	DV12 SrI	552 (750)	625	6660 x 2000 x 2705	7500

Note:

- Genset ratings are as per ISO 8528 performance class G2.
- Prime Power Rating is the maximum power available continuously for a variable electrical load for unlimited number of hours per year under standard operating conditions.
- Single phase genset option available up to 30 kVA.
- For E-Series fuel tank integral with base frame.
- For site conditions other than standard operating conditions, consult KOEL for available prime power.
- Specific gravity of diesel is considered as 0.845 (+5 % tolerance as per ISO 3046).
- All canopy dimensions have tolerance of $\pm$ 50 mm.

- In view of continuous product updating and design changes, all above specifications and dimensions are subject to change without prior notice. Also refer to latest product catalogue for updates.
- For the site conditions other than standard operating conditions, consult Seller or Kirloskar's Area Office.

Overall Specifications of Kirloskar Green Silent Gensets

Air cooled Silent Gensets

Genset Model	Engine Model	Engine Power at 1500 rpm. kW (hp)	Prime Power Genset rating at 0.8 pf (kVA)	Overall Canopy Dimensions L x W x H (mm)	Approx. weight (with canopy) kg.
SEKG5AS7	EA10	7.4 (10)	5	1600 x 820 x 1320	650
SEKG7.5AS5	EA16	11.7 (16)	7.5	2070 x 820 x 1320	850
SEKG10AS5	EA16	11.7 (16)	10	2070 x 820 x 1540	850
KG15AS4	HA294 SrIII	15.1 (20.5)	15	1770 x 1050 x 1400	1220
KG25AS-C	HA394	23.5 (32)	25	2030 x 1050 x 1400	1350
KG30AS	HA494	31.6 (43)	30	3130 x 1100 x 1680	1440
KG40AS	HA494T	41.2 (56)	40	3220 x 1100 x 1680	1580
KG45AS	HA494T	41.2 (56)	45	3220 x 1100 x 1680	1580
KG50AS	HA694	47.8 (65)	50	3980 x 1240 x 1680	1870
KG70AS	HA694T	61 (83)	70	3980 x 1240 x 1680	1920

Note:

- Genset ratings are as per ISO 8528 performance class G2.
- Prime Power Rating is the maximum power available continuously for a variable electrical load for unlimited number of hours per year under standard operating conditions.
- Single phase genset option available up to 30 kVA.
- For E-Series fuel tank integral with base frame.
- For site conditions other than standard operating conditions, consult KOEL for available prime power.
- Specific gravity of diesel is considered as 0.845 (+5 % tolerance as per ISO 3046).
- All canopy dimensions have tolerance of ± 50 mm.

- In view of continuous product updating and design changes, all above specifications and dimensions are subject to change without prior notice. Also refer to latest product catalogue for updates.
- For the site conditions other than standard operating conditions, consult Seller or Kirloskar's Area Office.

Sizing of KGPI Genset

To select the right Genset under a given set of circumstances, knowledge of Genset and its performance under various conditions is necessary.

It is also equally necessary to understand load characteristics and to make a load analysis. Beyond that, the effect of the voltage regulation systems plays an important role.

It is better to select a slightly larger generator capacity than the available load; the reason is that additional uses are invariably observed after it has been installed. These are usually not predictable. By having a margin available it is possible to power some loads which may have been overlooked during Genset selection, or which may be added after the installation of the Genset.

Ratings

The rating of an alternator is expressed either in kilowatt (kW) or kVA. The relation between kW and kVA rating is

kW = kVA x Power Factor

$$kW = \frac{1.732 \times V \times A \times \text{Power Factor}}{1000}$$ (for 3 phase alternator)

$$kW = \frac{V \times A \times \text{Power Factor}}{1000}$$ (for a single phase alternator)

*Load variation between phases should not be more than 10%.

Where V = Line voltage; A = Line current

Power Factor

The power factor of electrical system depends upon the nature of characteristics of load e.g Induction motors, furnaces, thyristor, power electronics etc.

Power Factor is lagging for inductive load.
Power Factor is leading for capacitive load.
Power factor is unity for purely resistive loads.

Normally, a generator is designed for a power factor of 0.8

The table below gives power factors of non-motor loads.

Type of load	Power Factor
Incandescent lights	1.00
Heating elements, ovens	1.00
Fluorescent lights	0.90
Induction furnaces	0.60 - 0.70
Arc furnaces	0.80 - 0.90
Welding Set (Transformer)	0.60
Welding Set (AC Motor-DC Generator)	0.80 - 0.90
Transformers	0.80 - 0.95

Block Loading

For Naturally aspirated engines : 100% of rated power

For Turbocharged and Turbo after cooled engines: Please consult Seller or Kirloskar's Area Office for load pattern and sequencing.

Deration Factor

The engine's horse power as mentioned on its name plate is the HP which an engine can deliver at MSL at NTP conditions. HP delivered at site will vary depending on site conditions (deration due to altitude, temperature and humidity). For details of site derations please consult Seller or Kirloskar's Area Office.

Steps to be followed while sizing the Genset.

Step 1

Collect all necessary basic data of load. Tabulate the details such as lighting load, motor load, A/C load, heaters load etc with quantity and name plate details. For motor loads, mention starting method also.

Step 2

(Applicable For Three Phase Genset)

Convert all single phase loads to three phase loads by distributing equally on three phases.

Step 3

Starting power (kVA) of each equipment is based on type of starting method. For e.g. In case of motors,

- ⇨ Starting by DOL will pull up to 6 to 7 times the rated full load kW of a motor.
- ⇨ Star/Delta will pull up to 2 to 3 times the full load kW of the motor.
- ⇨ Soft Start will pull up to 1.2 to 1.5 times the full load kW of the motor.

Rectifier loads may also pull up to 50% above their rated kVA.

Step 4

Sum up all the steady state running loads in kVA and sum up all the starting kVA's. These two figures will be used to size up the Genset and sequence of loading.

Step 5

Determine the maximum allowable voltage dip which the Genset should experience when the total starting KVA is applied on this Genset. This voltage dip percentage is usually known to the customer based on equipment type to be powered.

Step 6

The previously obtained figures (Running KVA, Starting KVA, Voltage, Voltage Dip, Loading sequence) will decide Genset size.

(For correct sizing of DG Set, please consult seller or Kirloskar's area office)

Location

Dust and Fumes are the greatest danger to generating set as they could lead to clogging of cooling and air system which may affect Genset performance.

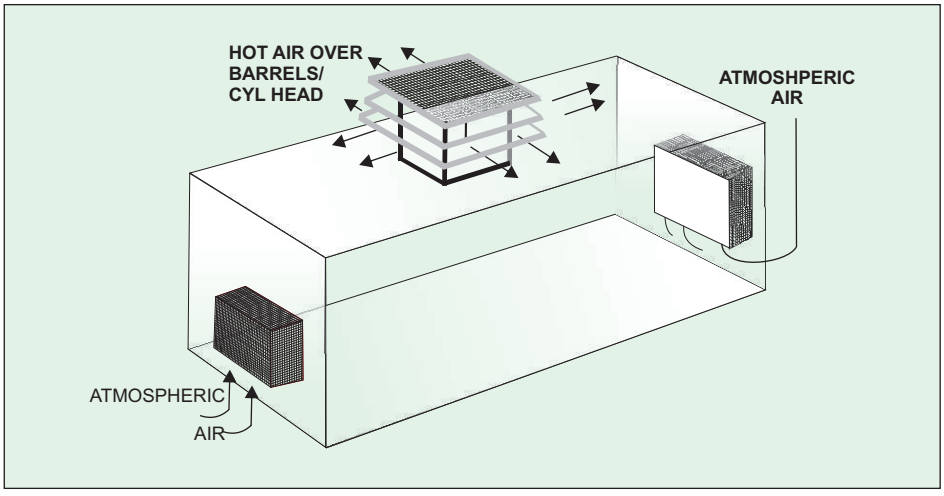
1. If KGPI Genset is to be installed in Free field condition, please ensure dust free location and clear space of 2 times the height of Genset.
2. If KGPI Genset is to be installed in the room, please ensure proper cross ventilation, clear space of minimum 3 meters from all sides.
3. If KGPI Genset is to be installed on a roof top, please ensure structural clearance, proper cross ventilation with respect to wind direction, clear space of minimum 3 meters from all sides.
4. If KGPI Genset is to be installed in the basement, please ensure ventilation with respect to Air requirement and clear space for easy maintenance.

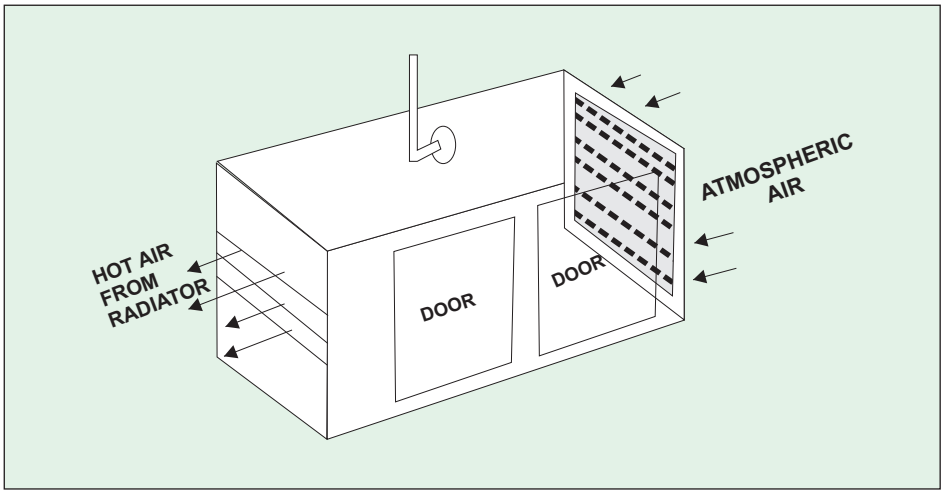
Layout

- Allow easy accessibility to Genset for easy operation and maintenance.
- Locate the Genset considering the prevailing wind direction.
- Genset installation should be as close as possible to the load. However in some cases, like stone crusher plant, garment plant, cement factory, paint factory, chemical factory, etc. the Genset should be isolated from the dust, hazardous and chemical fumes contained in the surrounding air.
- In case, Genset is to be installed in heavy dusty conditions, it is recommended to use heavy duty air cleaners (Please contact Seller or KOEL Area office for further guidelines).
- For fuel supply and fuel storage arrangement for Genset, follow the local rules and regulations.
  - The environment protections
  - The fire protection
- In case of high humid atmospheric conditions, an anti condensation heater should be used for the alternator.
- A rooftop installation requires proper planning and the structural design considerations for dynamic loading.
- Proper consideration should be given to take exhaust gases away from Genset location and shielded for hot surface.
- **Noise**
  - There should be sufficient space around the Genset to avoid resonance and echo effect which contributes to abnormal sound from Genset.
  - The space should be open without any obstacles.

Ventilation

- Cross ventilation and free flow of cool, clean and fresh air.
- The space should be open without any obstacles.
- For room and basement installations, supply of fresh air and removal of hot air should be done through forced ventilation with suitable air ducts.
- Maximum allowed temperature rise above ambient in Genset Enclosure at air intake of engine is 7–9 deg centigrade.

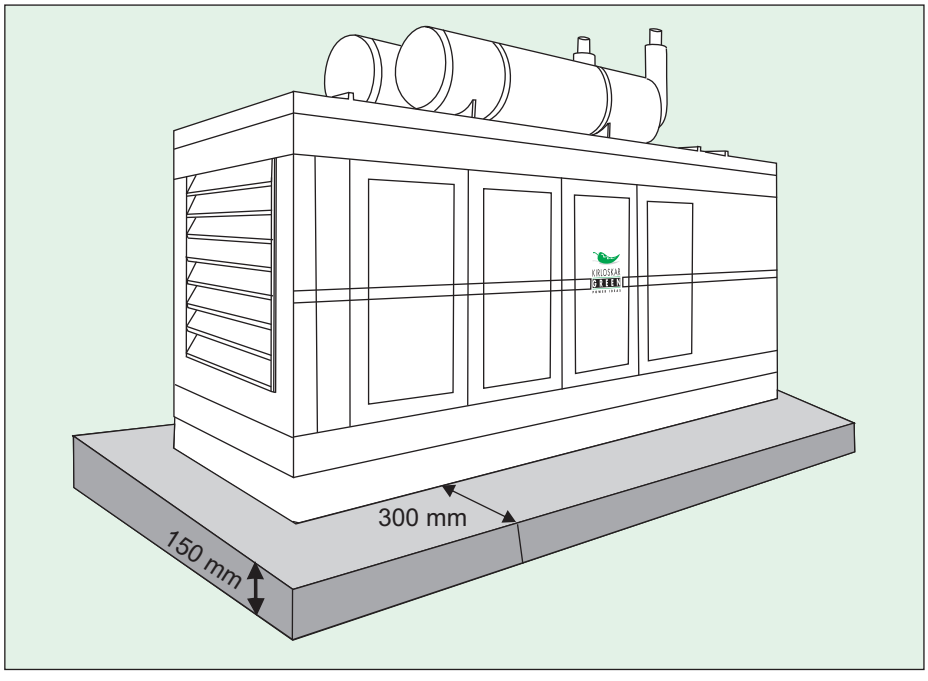


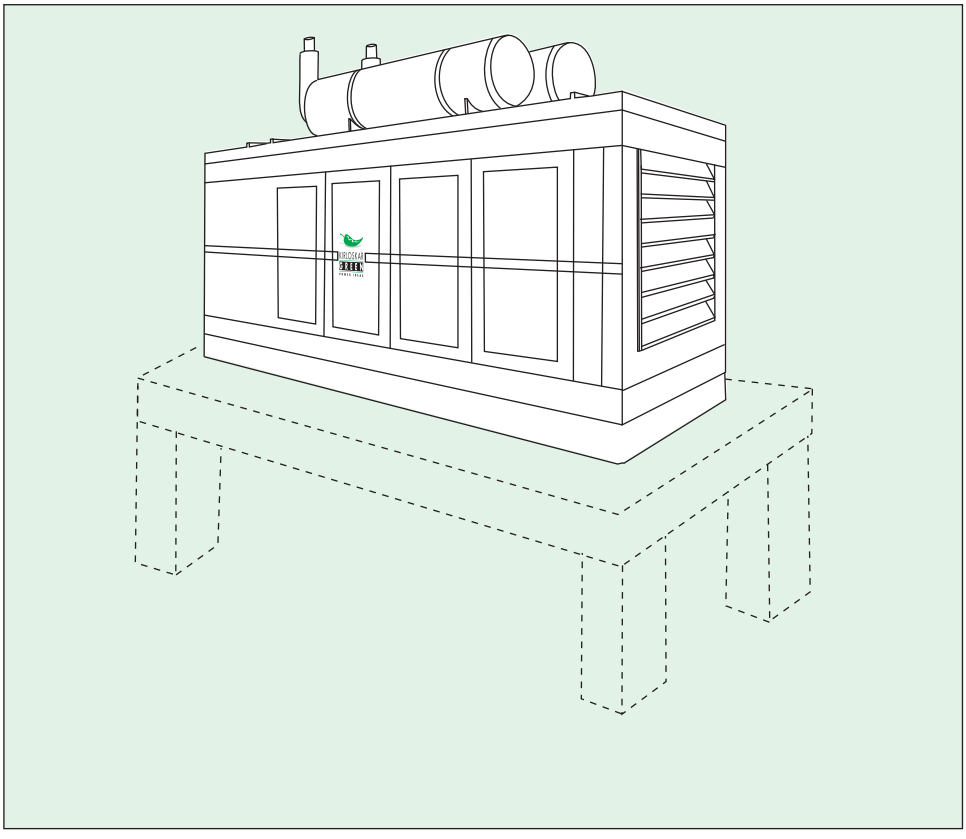


Foundation is one of the important factors affecting the successful operation and life of a generating set. Improper foundation may result in alignment and vibration problems which may subsequently lead to pre-mature failure of Genset Components and Safety.

The basic functions of foundation are given below.

- To provide leveled platform to seat and seal the Genset.
- To support the weight of the entire generating set.
- Support the dynamic load of Genset while running.
- Absorb the vibration produced by the rotating and reciprocating masses.
- Isolate the surrounding structures by absorbing the vibration of generating set while running.





While casting the concrete foundation, the bearing strength of the soil at site of installation should be determined. The table below gives approximate safe bearing capacity of various soils for ref.

Nature of the load bearing material	Safe bearing capacity kg/sq. meter
Hard Rock Granite	2,44,100 – 9,76,400
Medium Rock Shell	97,600 – 1,46,400
Hard Pan	78,100 – 97,600
Soft Rock	48,800 – 58,600
Hard Clay	39,000 – 48,800
Gravel and Coarse Sand	39,000 – 48,800
Loose, Medium Coarse and Compact Fine Sand	29,300 – 39,000
Medium Clay	19,500 – 39,000
Loose Fine Sand	9,750 – 39,500
Soft Clay	9,750

- The length and width of foundation should be at least 300 mm more on each side than acoustic enclosure length and width respectively.
- It is recommended to have foundation height of 150 to 200 mm above ground level to maintain cleanliness and avoid flooding.
- Check the foundation level diagonally as well as across the length and width for even flatness and same should be within ± 50 mm in horizontal plane in any one direction only.
- Ensure that the concrete is completely cured before positioning the enclosure.
- Ensure that the foundation to support 1.5 times of the total wet weight of the single generating set installation and 2 times of the total wet weight for the multiple generating set installation.
- For rooftop installations, it is necessary to have planning and structural design approval.

Do not install acoustic enclosure on loose sand or clay. Avoid hard / sharp projections such as stone or steel parts on foundation surface, which may damage fuel tank at the bottom.

Avoid uneven foundation which may lead to improper resting of Genset on foundation, there by leading to leakage of sound and vibration on Genset.

If Genset is to be mounted on foundation having uneven surface under unavoidable circumstances, use appropriate thickness of rubber matting above foundation for positive sealing of Genset with base.

- All the Gensets are provided with suitable lifting arrangements.

  Unload the Genset, by lifting with proper lifting tackle/nylon sling/soft sling with spreader bar / spacer plate of suitable capacity to avoid any damage.

- Do not drag the Genset on floor/ground.
- Use lift points on the acoustic enclosure (canopy) which provides support to the equipment when it is moved. This makes it easier to set them up on the foundation.

Genset Exhaust system directs the hot flue gases into the atmosphere harmlessly.
On KGPI Genset, exhaust silencer and expansion bellow are the integral parts of the exhaust system. At the time of Genset installation, please ensure proper alignment of exhaust silencer with respect to expansion bellow.

While taking exhaust gases away from Genset above stack height, please refer to the table below for selecting the size of exhaust pipe.

As per Statutory regulations, exhaust pipe has to be extended above the surrounding stack as below.

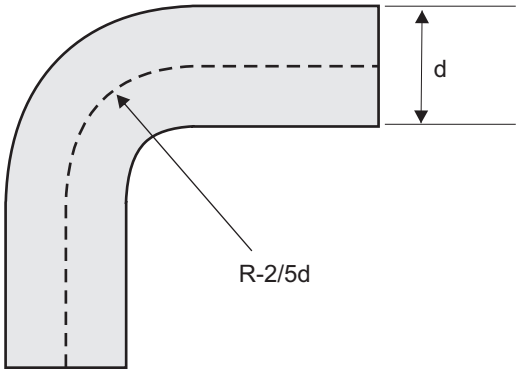
$H = h + 0.2 \times v$ kVA
Where H = Minimum height of exhaust stack, h = height of building.

Engine Model (Liquid Cooled)	Minimum pipe inside diameter in mm.
EW – Series	63
2R / 3R / 4R	63
4RTA / 6RT	75
4KTA / 6RTA / 6KTA	100
6SL – Series	125
DV – Series	125

Engine Model (Air Cooled)	Minimum pipe inside diameter in mm.
EA10 / EA16	50
EA20	63
HA2/ HA3/ HA4	63
HA4 T/ HA6/ HA6T	75

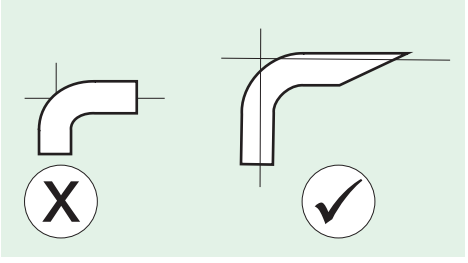
Note :
- If the extension of exhaust pipe is more than 5 meters above Genset, increase pipe diameter by 13 mm for every 3 meters.

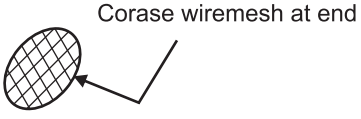
Exhaust bend
Bends used in exhaust piping should have a long smooth bend as shown in figure to ensure smooth flow of exhaust gases.



Note :

- If No. of bends are more than 4, increase the diameter of exhaust pipe and bend by 13 mm for addition of each bend.
- The exhaust outlet should be in the direction of prevailing wind.
- Exhaust outlet should have 30^0 cut at the tail end with Coarse wire mesh.

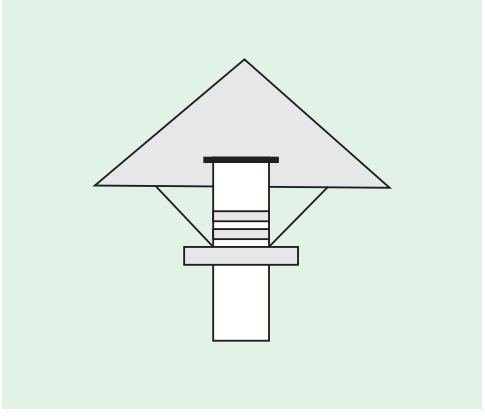


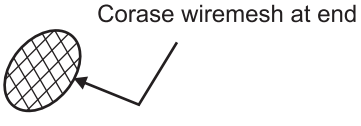


Rain Cap

If horizontal exhaust outlet as recommended above is not possible, provide a rain cap over exhaust pipe end as per the figure below. The distance between exhaust pipe and rain cap should be higher than diameter of pipe (minimum 2.5D) with coarse wire mesh.

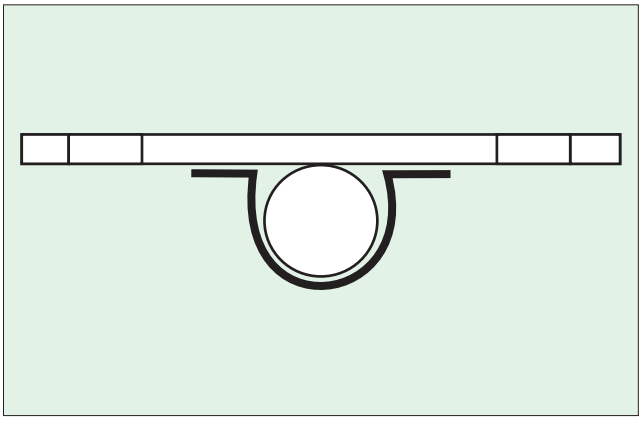
- It is also recommended that horizontal run of exhaust piping should slope downwards away from engine to the condensate trap. Silencer should be installed with drain plug at bottom.





Exhaust Support

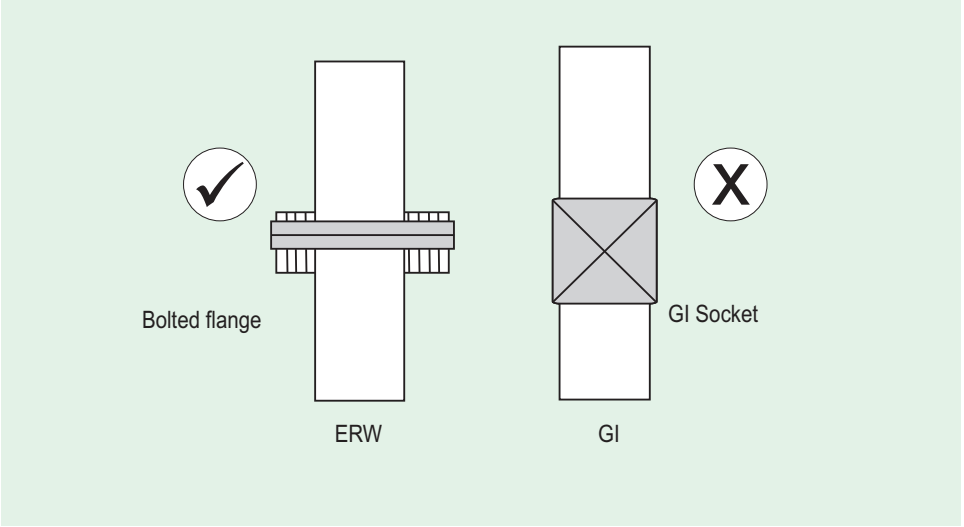
Proper support is required for the extended exhaust pipe above Genset to ensure no self weight is transferred on to the Genset.



Type of Exhaust Pipe

Use black MS ERW (Electric Resistance Welded) - Class B Type pipes. Galvanised Iron pipes should not be used. Exhaust pipes should be joined through flanges.

Exhaust pipe through out should be cladded by mineral wool with aluminium sheet (0.8mm). Minimum thickness of cladding should be 50 mm.



Liquid Cooled Engine

Kirloskar Liquid Cooled Engines use premixed coolant for removal of heat generated in the engine due to internal combustion and to maintain optimum operating temperature for efficient engine operation.

KGPI Genset – Liquid Cooled are delivered with initial fill of Pre-mixed Coolant "K-Cool Super Plus".

- Ensure NO addition of water in coolant.
- Ensure 'Top Up' only with "K-Cool Super Plus" coolant.
- Ensure coolant level in Compensation Tank between "Min and Max" Level.

Air Cooled Engine

Kirloskar Air Cooled Engines use Air as a cooling media for removal of heat generated in the engine through cooling passages and to maintain optimum operating temperature for efficient engine operation.

- Ensure cleanliness of cooling air passages.

Lub Oil System

Kirloskar engines utilize the pressure lubrication system with the lub oil filter adequately designed to handle the flow of lubricating oil at the designed pressure and temperature for Lubrication, Cooling and Cleaning of internal components.

KGPI Gensets are delivered with initial fill of Lub Oil "K-Oil Super".

- Check the Lub Oil level with the help of Dipstick to "H" Mark and top up if required with "K-Oil Super" only.

K-Oil Super SAE 15W 40 is a specially blended engine oil which ensures:

- ✓ Increased change intervals.
- ✓ Better oxidation stability and hence less top-ups.
- ✓ Reduced frictional wear.
- ✓ Increased internal cooling.
- ✓ Protection against rust and corrosion.
- ✓ Reduced carbon deposits.

Use of the wrong grade of oil could lead to:

- × Overheating of the engine.
- × Sluggish performance.
- × Excessive fuel consumption
- × Increased wear of bearings and other moving components.

Fuel System

The fuel (High Speed Diesel) should comply with the following International Standards.

DIN 51601
IS : 1460 1995
ASTM D 975–81 : 1D & 2D

- Ensure fuel filling point is accessible and clean all the time.
- Ensure all fuel piping is leak free.
- Avoid fuel spillage.
- Ensure fuel dilution does not occur.
- Care should be taken while filling of tank to prevent ingress of dust & moisture inside diesel tank.
- It is recommended to fill fuel after stopping of the Genset to avoid condensation.

It is recommended not to fill fuel during running of Genset.

Earthing

Any leakages in current will be earthed through the shortest route in the link.

KGPI Genset should be connected to earth in accordance with local regulations.

The size of the link used for the main earth connection should be of adequate size as shown in table below.

The generating set and all associated equipment must be earthed before the set is put into operation.

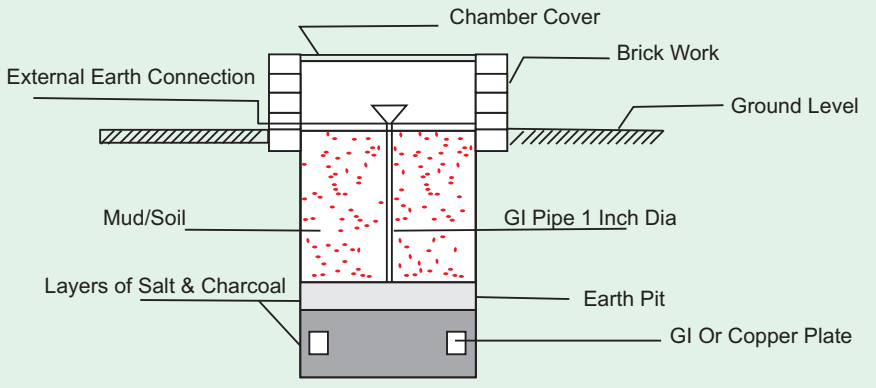
4 numbers of earth pits are required as per Indian Electricity rules / local electricity regulations.

- 2 earthing pits for Genset / control panel body
- 2 earthing pits for neutral.

Resistance between 2 earth pits should not be more than 5 Ω.
Typical Earth Pit diagram is as shown in figure.

Genset Rating	Recommended Earth Strip / Cable
5 – 82.5 kVA	8 SWG – Copper
100 – 250 kVA	25x3mm CU / 25x6mm GI
320 – 500 kVA	50x6mm CU / 50x6mm GI 2 runs
625 – 750 kVA	50x6mm CU / 50x6mm GI 2 runs

TYPICAL EARTH PIT / STATION ARRANGEMENT



Power Cable

Cabling from Alternator to Panel should be done with proper size of cable and lugs. Typical cable sizes provided in the table are indicative. Please refer to cable manufactures for details.

- Ensure tight crimping / terminations to avoid overheating and burning of the cable and terminals.
- Ensure correct size of glands and gland plates are used to avoid tension on alternator terminal, terminal box and control panel terminations.
- Ensure phase colour coding is adopted while terminating cables at both the ends of Alternator and Control Panel.
- Ensure proper bending radius is given to the cable to avoid excessive tension on cable termination.
- For extended control cabling, use 10/12 core 2.5 sq mm of armoured copper cable.
- Any type of control and monitoring cables should be sheathed and should be within 5 meters length for accurate performance.
- Ensure that the weight of cables does not rest on alternator terminations. Proper support to be provided from the ground separately through cable tray.

Typical Cable Sizes for KGPI Genset

Cable selection chart

A) Three Phase Generators:

Sr No.	kVA	Voltage	F/L Current for 3 Ph Alternator		Cable Size at 40 deg ambient for 3.5 core cable				
			1 PF.	0.8 PF.	Size of Copper Cable (Sqmm)	Rating of Copper Cable (A)	Total Cable requirement (sqmm)		Rating of Aluminium Cable- AYFY (A)
							Cable size in Sqmm	No. of multiple runs	
1	10	415 V	11.13	13.91	2.5	24	For Lower Rating Copper Cables are preferred		
2	15	415 V	16.70	20.87	4	30			
3	20	415 V	22.26	27.82	4	30			
4	25	415 V	27.83	34.78	6	39			
5	30	415 V	33.39	41.74	10	52			
6	35	415 V	38.96	48.69	10	52	25	1	63
7	40	415 V	44.52	55.65	16	66	25	1	63
8	45	415 V	50.09	62.61	16	66	35	1	77
9	50	415 V	55.65	69.56	25	90	35	1	77
10	62.5	415 V	69.23	86.54	35	90	50	1	95
11	70	415 V	77.91	97.39	35	110	70	1	115
12	75	415 V	83.48	104.34	50	110	70	1	115
13	82.5	415 V	91.83	114.78	50	135	70	1	115
14	100	415 V	111.30	139.12	-	-	95	1	140
15	125	415 V	139.13	173.91	-	-	150	1	175
16	140	415 V	155.82	194.77	-	-	185	1	200
17	160	415 V	178.08	222.60	-	-	240	1	235
18	180	415 V	200.34	250.42	-	-	120	2	279
	180	415 V	200.34	250.42	-	-	300	1	260
19	200	415 V	222.60	278.25	-	-	120	2	279
	200	415 V	222.6	278.25	-	-	300	1	260
20	250	415 V	278.25	347.81	-	-	185	2	360
21	275	415 V	306.08	382.59	-	-	240	2	423
23	320	415 V	356.16	445.20	-	-	300	2	468
25	400	415 V	445.20	556.50	-	-	240	3	564
	400	415 V	445.2	556.50	-	-	150	4	560
26	500	415 V	556.50	695.62	-	-	240	4	752
	500	415 V	556.5	695.62	-	-	300	3	655.2
26	600	415 V	667.80	834.75	-	-	300	4	832
	600	415 V	667.8	834.75	-	-	240	5	916.5
27	625	415 V	695.63	869.53	-	-	185	6	900

Typical Cable Sizes for KGPI Genset
Cable selection chart
A) Single Phase Generators:

Sr No.	kVA	Voltage	F/L Current for 1Ph Alternator		Cable Size at 40 deg ambient for 2 core cable			
			1 PF.	0.8 PF.	Size of Copper Cable (Sqmm)	Rating of Copper Cable (A)	Size of Aluminium Cable (Sqmm)	Rating of Aluminium Cable (A)
1	10	230	34	43	6	45	10	56
2	15	230	52	65	16	78	16	71
3	20	230	69	86	25	105	25	93
4	25	230	86	108	25	105	35	110
5	30	230	104	130	35	125	50	130

Important Notes:

1. Please use Comet make cable glands.
2. Type of cable gland: Single Compression Heavy Duty Cable Gland.
3. Material of cable gland: Brass.
4. The amp. rating of cable is considered as per duct laying method and 700 C operating Temperature mentioned in manufacturers catalogue.
5. Considered amb temp: 400 C.
6. For grouping of cables (multiple runs) the derating factors are considered as per duct laying method of cable.
7. The distance between two parallel cables is considered 30 mm for deration.

Engine model	Ambient Temp	Battery Specification		Battery cable size.	
		12V Starting	24V Starting		
E Series		System	System	35 sq. mm	Multistrand PVC flexible Red and Black colour 1.25 mts Copper cable with suitable lugs (one side battery lugs and one side round lugs)
	>+10	88	-		
HA 294, 394	-20 to +10	135	-		
	>+10	88	-		
HA 494, 494T	-20 to +10	135	-		
	>+10	100	-		
HA 694, 694T	-20 to +10	150	-		
	>+10	150	-		
2R 1040, 3R 1040	-20 to +10	180	-		
	>+10	88	-		
4R 1040, 4R 1040T	-20 to +10	135	-		
	>+10	135	-		
4R 1040TA, 4K1080	-20 to +10	160	-		
	>+10	150	-		
6K 1080, 6R 1080T, 6R 1080TA	-20 to +10	160	-	50 sq. Mm	
	>+10	150	-		
SL Series	-20 to +10	-	2 x 12V 200 AH		
	>+10	-	2 x 12V 180 AH		
DV Series	-20 to +10	-	2 x 12V 200 AH	70 sq. mm	
	>+10	-	2 x 12V 180 AH		

Ensure that the polarity of the battery connections are correct before switching on the DC controls.

Never attempt to start the Genset if battery charge is insufficient to start the engine. Get the battery charged or replaced and then try to start.

During installation and maintenance, disconnect the battery.

For prolonged storage, used static battery charger to keep battery fully charged.

Specific Gravity of Lead Acid in the Battery at various stages:

100% Charge – 1.27 to 1.24 gm/cc (Yellow)

70% Charged – 1.24 to 1.20 gm/cc (Blue)

Needs Recharge – Below 1.20 gm/cc (Red)

Ensure tightness of all external fasteners, hose clamps, V-belt tension as per specifications.

Ensure Cleanliness of the Genset.

Lubrication:

- Check Lub oil level with help of Dipstick and if required, top up to H-Mark with "K-Oil Super".

Fuel:

- Ensure fuel tank is clean from inside.
- Fill fuel tank with clean High Speed Diesel.
- Bleed the fuel system as shown in maintenance manual.

Cooling:

Liquid Cooled Engines.

- Check Coolant level inside Radiator and Compensatory tank. If required Top up with "K-Cool Super Plus".

Air Cooled Engines:

- Check Blower Fan belt tension.

Electrical:

- Check Battery Polarity.
- Check Battery cables are correctly connected and secured.
- Check all other electrical connections and tightness.
- Ensure Emergency Push Button is in released condition.
- Ensure Load Change Over Switch / Breaker is in Off condition.

Procedure: Starting KGPI Genset

Before Starting

- Clean the Genset with dry cloth.
- Check the lub oil, coolant and fuel levels – top up if required as per recommendation given.
- Check for V-belt, Hoses and external leakage if any.
- Ensure Load Change Over Switch / Breaker is in Off condition.

On Starting

For Key Starting

- Do not crank engine for more than 5 seconds.
- As soon as engine fires, release the start key. Leave ignition switch in "ON" position.

For Push Button Starting

- Gently press Start button once and release.
- If engine fails to start, wait for a minute and try again.
- Check for leakages if any.
- Allow the engine to idle for 3 minutes and then start loading the Genset gradually in steps.
- Check for Engine parameters like Oil Pressure, Coolant Temp and Battery charging rate at regular intervals while the Genset is in operation and maintain log book.
- Check for exhaust smoke.
- Check for abnormal noise if any.
- Check for A C Alternator parameters like Voltage, Ampere, KW, PF on all phases.
- Ensure load is balanced in all phases as per recommendation and within rated output of Genset.
- Check all gauges and meters provided in Control Panel are working.

Procedure: Stopping KGPI Genset

Before stopping

- Remove the load from Genset and let it run for about 3 minutes.
- For Key Start, put Ignition key in "Off" condition.
- For Push Button Start, push Stop button gently once and release.

After Stopping

- Check for leakages if any.
- Top up the Fuel Tank.
- Ensure proper closing of Genset Enclosure.

LOG SHEEET (Sample for use)

The user is requested to maintain a separate log book registering the following mentioned parameters in the table.

Following tables are meant for providing a reference to you.

Date						
Daily use in hrs.						
Hour meter reading						
Cooling Water Temp (^{0}C)						
Lub. Oil	Pressure (Kg/cm^2)					
	Temp (^{0}C)					
Fuel added (ltr.)						
Lub. Oil added (ml)						
Engine (rpm)						
Current (Amp) 3-phase						
Voltage						
Frequency (Hz)						
PF & kW if provided						
kWH meter reading if provided						
Remarks – Record events of maintenance/repairs						

First oil change @ 50 hrs or 7 days of commissioning.

Series	Oil Change hours	Oil Filter Change hours	Fuel Filter Change hours*	Air Cleaner element change hours**	V Belt Change hours
EW/EA	500	500	500	1000	1000
HA	500	500	500-for HA4/HA6 (1.1 Ltr)	1000- for dry type air cleaner element. 250 – Oil change for Oil bath Air Cleaner	1000
RB/RV	250	250	250	1000	1000
R1040/R1080	500	500	500	1000	1000
SL90	500	500	500	1000	1000
Dv Series	500	500	500	500	2000

* Fuel Filter Pre and Micro to be replaced alternatively after 250 hrs. for 1.1 Ltr. and 125 hrs. for 0.5 Ltr.

** Air filter change is based on Ideal site condition, however extreme dusty condition change frequency is based on occurrence of red band in restriction indicator.

It is recommended to get the routine maintenance done through Kirloskar Authorized dealer.

- Remove dust deposit from the cylinder heads, liners fins, lub oil cooler fins, radiator and A C Alternator with compressed air. Cleaning with diesel fuel or kerosene may cause dust to deposit again on the cleaned parts.
- Open the air duct while cleaning of Air Cooled Engine.
- Cleaning should be done from the opposite side of the system air flow.
- When deposits are hard, scrape and clean with a water jet. Run the engine after such cleaning till all the water evaporates.
- Do not clean electrical components like main alternator, starter, charging alternator, control panel, gauges, wiring connections, etc. with water.
- When the Genset is kept idle for more than 6 months, it is advisable to protect it from atmospheric moisture, condensates, internal corrosions and rodents.

Recommended Preservatives:

Manufacturer	Engine lub oil and Fuel system	Engine cooling system for liquid cooled	Unpainted ferrous metal parts
Bharat petroleum	Bharat Preserve oil 30	Bharat Sherol B Emulsion with water ratio 1:20	Bharat Rustrol 152
Hindustan petroleum	Autoprun T120	Koolkit 40.5%Emulsion with water	Rustop 274
Indian oil corporation	Servo Preserve 30 OR Servo 'Run-N' Oil 30	Servo Cut S 20% Emulsion with water	Servo RP 125
Castrol India	–	–	Russtilo DW 904 OR DW901
Veedol tide water oil co.	Veedol 30/40	Veedol Amulkut 4 Emulsion with water in ratio 1:15	Veedol Rustop IT

Alternatively 'Surprabha VCL 302' of Suprabha products can be used in engine cooling System.

For preservation and recommissioning, please consult KOEL Area Office.

- The after sales service to KGPI Genset is provided through KOEL's country-wide network of authorized spare and service dealers. Service dealers are equipped with all necessary tools and tackles to take care of every need of service.
- We understand how important after-sales support is to your business. Where your business operations are far reaching across the country & moreover when they are located in absolute remote places, your business counts on reliability & availability of prompt service to ensure minimum downtime.
- We are committed to provide adequate after sales service support & believe in creating an enduring relationship with every individual customer we serve.
- Our service team is always round the corner to provide onsite assistance and comprehensive Service support ensuring your power needs are fulfilled
- Before commissioning the KGPI Genset, please go through the contents of the warranty document.
- For any of your service requirements please contact nearest service dealer or KOEL Help Desk.

Help Desk

Call 1800 233 3344

Email : koel.helpdesk@kirloskar.com

Customer Assistance is available from our 24 x 7
Help desk for Sales, after Sales and Service assistance.

Notes

After Sales Service Support

Customer Care :
Round the clock, at your service, whenever & wherever you need.

After sales service is the key to the long-term viability of any business. We are committed to provide adequate after sales service support & believe in creating enduring relationship with every individual customer we serve. Kirloskar believes in the wise saying " think global & act local" with full dedication, which have helped us, successfully achieve "100 years of great service".

Service Offerings

- Free service checks.
- Authorized Kirloskar Service Dealers in your neighborhood to promptly respond to your service calls, provide extensive after sales support including operational, maintenance & repair contract.
- Single window service for Genset & Customised AMC.
- 24/7 help line service for all our customers, offering timely customer support to deal with inquiries.
- Fully implemented CRM module to provide proactive & quick service response.
- Trained & experienced service team to provide value-added support to the highest standards ensuring customer satisfaction at all times.
- Support systems like Mean Time to Restore, Engine Down Order, First Pick Availability for maximum uptime of Gensets.
- K-oil / K-cool super plus for product life extension.
- Excellent product support through easy availability of spare parts, product training, Re-conditioning and warranty administration.
- Easy and Quick delivery… anywhere anytime.

Service Network across the Nation

Where your business operations are far reaching across the country & moreover when they are located in absolute remote places, your business counts on reliability & availability ensuring minimum downtime. Key to the quality of our after sales service is our strong service force, which are always ready to attend your calls anywhere anytime.

KOEL Sales Offices

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Enriching Lives

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Stamp of Authorised Representative

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